

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY


(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 31 MAR 2006

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Applicant's or agent's file reference CH920030009		FOR FURTHER ACTION		See Form PCT/PEA/416
International application No. PCT/IB2004/003696		International filing date (day/month/year) 09.11.2004	Priority date (day/month/year) 12.11.2003	
International Patent Classification (IPC) or national classification and IPC INV. B82B3/00 C23C16/04 H01J37/317				
Applicant INTERNATIONAL BUSINESS MACHINES CORPORATION et al.				
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 2 sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>				
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the report</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application</p>				
Date of submission of the demand 09.09.2005		Date of completion of this report 30.03.2006		
Name and mailing address of the International preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized officer Hoyer, W Telephone No. +49 89 2399-8439		



**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/IB2004/003696

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

Description, Pages

1-17 as originally filed

Claims, Numbers

1-10 filed with telefax on 22.09.2005

Drawings, Sheets

1/3-3/3 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos:
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	5, 7, 10
	No: Claims	1 - 4, 6, 8, 9
Inventive step (IS)	Yes: Claims	10
	No: Claims	1 - 9
Industrial applicability (IA)	Yes: Claims	1 - 10
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

1. The following documents are referred to in this communication:

- D1: YAU S T ET AL: "LASER-ASSISTED DEPOSITION OF NANOMETER STRUCTURES USING A SCANNING TUNNELING MICROSCOPE" APPLIED PHYSICS LETTERS, AMERICAN INSTITUTE OF PHYSICS, NEW YORK, US, vol. 57, no. 27, 31 December 1990 (1990-12-31), pages 2913-2915, XP000222958 ISSN: 0003-6951
- D2: US-A-5 294 465 (GALLAGHER ET AL) 15 March 1994 (1994-03-15)
- D3: SHTOKMAN M I: "Possibility of laser nanomodification of surfaces by means of a scanning tunneling microscope" OPTOELECTRON INSTRUM DATA PROCESS; OPTOELECTRONICS, INSTRUMENTATION AND DATA PROCESSING (ENGLISH TRANSLATION OF AVTOMETRIYA) 1989, no. 3, 1989, pages 27 - 37, XP009043144
- D4: BONEBERG J ET AL: "Mechanism of nanostructuring upon nanosecond laser irradiation of a STM tip"; APPLIED PHYSICS A: MATERIALS SCIENCE & PROCESSING, SPRINGER-VERLAG GMBH & COMPANY KG, BERLIN, GERMANY, vol. 67, no. 4, October 1998 (1998-10), pages 381-384, XP002315242
- D5: US-A-4 550 257 (BINNIG ET AL) 29 October 1985 (1985-10-29)
- D6: JERSCH J ET AL: "Nanostructuring with laser radiation in the near-field tip of a scanning force microscope", APPLIED PHYSICS A: MATERIALS SCIENCE & PROCESSING, SPRINGER-VERLAG GMBH & COMPANY KG, BERLIN, GERMANY, vol. 64, no. 1, December 1996, pages 29 - 32
- D7: DAY H C ET AL: "Selective area oxidation of silicon with a scanning force microscope", APPLIED PHYSICS LETTERS, vol. 62, no. 21, May 1993, pages 2691 - 2693

- 1.1 Documents D6 and D7 were not cited in the International Search Report. Copies of the documents have been already forwarded to the applicant.
2. The objections brought forward at paragraph VIII of the Written Opinion of the International Searching Authority still apply (see paragraph VIII below). It was already

pointed out that the apparatus of claims 1 - 5 and 7 - 9, even if limited to a device comprising an atomic force microscope (AFM), lacks novelty. Process features, even if characterizing a new process, are not limiting for an apparatus over the prior art, if the prior apparatus is suitable to carry out the process. AFM/laser devices are prior art. In this connection, applicant's attention is drawn to D6 which discloses at page 29 ("Experimental apparatus and results" and Figure 1) a device comprising a scanning force microscope (SFM, equivalent to AFM) and a light emitting device in form of a pulsed, Q-switched Nd:YAG laser beam. The tip is made from Si or Si₃N₄ with a curvature radius or "dimension" of 10 - 20 nm. The polarization of the laser beam is set in parallel to the longitudinal tip axis.

The device of D6 is considered as capable to be "adapted to emit a light beam having an intensity that is not capable to decompose the vapour, onto the tip in such a way that an electromagnetic field induced by the light beam near the tip is high enough to decompose the vapour".

- 2.1 The disclosure in D6 anticipates the subject-matter of claims 1 - 4, 6, 8 and 9.
- 2.2 Metallized tips used in SFM/AFM are entirely conventional, see D7, page 2691, left-hand column, 2nd paragraph. Thus, claim 7 referring to a metallized surface of tip, is not considered as inventive, either.
- 2.3 Furthermore, the subject-matter of claim 5 is not considered as inventive in the light of D6 and D2. The latter suggests a multi-tip arrangement, see Figure 6 and column 13, lines 22 - 32. D2 refers to the use of a scanning tunneling microscope (STM). However, this technical field is closely related to AFM (see e.g. D4, page 381, left-hand column, 1st paragraph of the article which discloses the equivalent suitability of AFM and STM in the technical field of nanostructuring by illumination of a scanning microscope tip). Thus, the skilled person would take account of the teaching in D2 in order to improve the efficiency of an AFM.
3. Consequently, the subject-matter of claims 1 - 9 does not meet all requirements of Art 33(2) and/or (3) PCT.

4. The subject-matter of method claim 10, now limited to the use of an AFM, does not appear to be known or implied from the available prior art documents. D1 to D5 refer only to STM devices. A process of decomposing a vapour as defined in claim 10 is not suggested by D6 or D7. Thus, the requirements of Art. 33(2) and (3) PCT are met for claim 10.

Re Item VIII

1. Claims 1, 4, 7 and 9 are apparatus claims which are partially or completely defined by process features or features of using the apparatus. An apparatus, however, must be distinguished over the prior art by apparatus features. Thus, these claims lack clarity (Art. 6 PCT) because the scope of protection sought is not clearly defined. In particular:
 - 1.1 The features "vapour of a material suitable for Chemical Vapour Deposition" and "light beam has an intensity that is not capable to decompose the vapour, onto the tip in such a way that an electromagnetic field induced by the light beam near the tip is high enough to decompose the vapour" are process features which cannot limit an apparatus over the prior art, if the prior art apparatus is suitable for such a process. The same applies for the features "is adapted to emit the light beam in such a way that the polarization is parallel to a longitudinal axis of the tip" (claim 3), "the wavelength of the light beam is adapted to match the size of the tip so that sufficient amplification of the emitted light is achieved" (claim 6). A conventional "light beam" in the art, such as the beam of a dye laser, can be adjusted for its wavelengths, intensities and polarization. The subject-matter of claims 8 and 9 refer completely to gases used in the apparatus and are thus not further limiting for the apparatus at all.
2. Consequently, the subject-matter of claims 1 - 9 is anticipated or implied by any device which comprises an imaging device having a metal or metallized scanning tip, such as an atomic force microscope (AFM) and a light emitting device adapted to emit a light beam, e.g. a laser (see novelty objections above).